



# Science News-Letter

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ASTRONOMY

## Astronomers Told of Comet's Wandering



*HOW SKJELLERUP'S COMET APPEARED through the telescope of the Lowell Observatory on December 16, 1927. From a drawing by E. C. Slipher*

On this page James Stokley reports on the interesting papers presented at the meeting of the American Astronomical Society. This was held at Yale University, December 29 and 30.

People who expected the Skjellerup comet to be a bright object in the western evening sky will be disappointed. The comet has turned around and is moving back again to the southern sky. This is shown by observations made at the Wellesley College Observatory by Prof. John C. Duncan, and announced at the meeting.

Professor Duncan had been observing the comet for several days with his telescope, and on Christmas he was surprised to find that it was south of the place where he had seen it on Thursday previous. According to the expectations of astronomers, it should have continued in its northerly motion. On Tuesday, December 27, he saw it again still farther south, confirming his Yuletide observation. Since the comet is rapidly getting fainter, it is unlikely that it will be observed with the naked eye again.

The astronomers saw what it looked like in a photograph made at the Low-

ell Observatory in Arizona. This, the first photograph to be made of this heavenly wanderer, was sent to the meeting by Dr. V. M. Slipher, director of the Arizona institution. Though only a white spot on a gray background, the photograph was received with applause because it had been made when the object was very close to the sun, which made pictures of it extremely difficult.

In the paper by Dr. Slipher details were given of observations of the comet by analyzing its light through the spectroscope. When first seen from there, on Friday, December 16, the spectrum revealed its light to be principally reflected sunlight, but in the next few days there appeared strong bands which indicated the presence of the element sodium, one of the two constituents of table salt. A peculiarity of these sodium bands was that they appeared not only in the light from the comet's nucleus, but also a long distance from it. These spectrum photographs also showed that it was moving away from the earth at a speed of nearly 60 miles a second.

### Brilliant Fireball

Comets were but one of many papers presented to the meeting. Dr. C. P. Olivier, of the University of Virginia, told of a fireball that had been observed last summer in North Carolina. This is a very brilliant shooting star. As the result of observations made by a number of laymen and communicated to Dr. Olivier, he has found that this fireball was about 76 miles above the surface of the earth when first seen, that its path was about 116 miles long and that it vanished at a height of 18 miles traveling with a speed of 17 miles a second. As it appeared in such a position that it overtook the earth as it sped along in its own orbit, its real speed must have been considerably greater he said.



*SKJELLERUP'S COMET photographed by E. C. Slipher of the Lowell Observatory on December 16, 1927. Made when the comet was within five degrees of the sun, this represents one of the most difficult astronomical photographs ever attempted*

### Eclipse Coming

If you missed seeing the eclipse of the sun visible in New England on January 24, 1925, you only need wait until 1932 for another chance. What is better, you can combine it with your vacation for this eclipse will happen on August 31, 1932. The path of totality, in which the moon will completely cover the sun and the corona which surrounds it will flash out in all its glory, crosses the White Mountains of New Hampshire, Miss Caroline Furness, of Vassar College, stated.

The exact path of this eclipse, the next to be seen in the United States, has just been worked out by Dr. L. J. Comrie, of the British Nautical Almanac Office, in London. It was presented at the meeting of the American Astronomical Society. Pre-

*(Just turn the page)*

# INDEX TO THIS ISSUE

Aitken, R. G.	11	Environment Important	6	MacDougal, D. T.	13	Sirius, the Dog-Star	11
Allison, Fred	7	Evolution on New Phase	4	Mariette, August	9	Skjellerup Comet Misbehaving	1
Amer. Assoc. Adv. Science Meeting	3	Evolution Reaffirmed	4	Marriott, Ross W.	2	Slipher, V. M.	1
Amer. Astro. Soc. Meeting	1	Feathers Depend on Skin	15	Mateer, Florence	6	Social Intelligence Useful	5
Amer. Psychological Assoc.	5	Flint, L. H.	13	Monkeys Judge Time	5	Spelling Test, New	5
Bagg, H. I.	7	Frappie, F. R.	15	Moss, Fred A.	5	Stadler, L. J.	7
Baker, A. C.	13	Freeman, Frank N.	6	Muller, H. J.	7	Star Story for January	11
Becker, J. A.	8	Fruit Pest Eradicated	13	Nature Ramblings	15	Stromgren, Elis and Bengt	15
Birds' Feathers Depend on Skin	15	Geranium	15	Noyes, A. A.	4	Sullivan, Mark	15
Bloch, Eugene	15	Goodspeed, T. H.	7	Olivier, C. P.	1	Thermionic Phenomena	15
Classics of Science	9	Hance, Robert T.	7	Osborn, Henry Fairfield	3	Trees Contain Air	13
Comet Wandering, Skjellerup	1	Health of World in 1927	13	Our Times	15	Wall, E. J.	15
Comrie, L. J.	1	Heck, N. H.	9	Overton, J. B.	13	Wallin, J. E. W.	5
Curtis, Winterton C.	7	Heredity, X-rays Change	7	Paper Carpet in Gardens	13	White Lead	15
Danforth, C. H.	15	Howard, L. O.	13	Photography, Amer. Annual of	15	Woodrow, Herbert	5
Duane, William	7	Indiana, Musical Test to	5	Quake Risk Study	9	X-rays Change Heredity	7
Eclipse of Sun 1932	1	Insects, Europe's War on	13	Ritter, William E.	6	X-rays from Gases	7
Electrons, Coating Helps	8	Interior Annual Report	15	Ruckmick, C. A.	6	X-ray Property, New	7
Europe's War on Insects	13	Isbell, Rachel	5	Russell, Henry Norris	2	Verkes, Robert	5
		Kingsbury, Forrest A.	6	Serapeum, Discovery of the	9	Zweite Sammlung Astronomischer Miniaturen	15
		Labor, Secretary of, Annual Report	15	Shellow, Sadie M.	6	Science News-Letter, Jan. 7, 1928	
		Liddell, H. S.	6				

## Astronomical Meeting

(Continued from page 1)

vious determinations of the track, he stated, are much in error. The path in which the eclipse will be seen as total, as given in a famous work by Oppolzer, an Austrian astronomer, and known as the "Canon of Eclipses," is much farther north than it will actually be, said Dr. Comrie. A later determination by an American astronomer is also in error, it was stated. Dr. Comrie's more accurate figures were made possible by the recent "Tables of the Moon," by Prof. Ernest W. Brown, of Yale University.

"Roughly speaking" says Dr. Comrie, "the eclipse occurs at 3:30 p. m., local time, lasts 100 seconds, the sun being 30 degrees high, and the track 100 miles wide. The central line runs from Pierreville, Quebec, to Biddeford, Maine. At points along this line the eclipse will have the longest duration. The southern limit of the area in which the eclipse will be seen as total runs from Montreal to Salem, Mass., and the northern limit from St. Jean des Chaillons, Quebec, to Richmond, Maine. The central line passes over the White Mountains, which will probably provide some good observing sites."

Three Rivers and Sherbrooke, Quebec; Portland, Maine, and Portsmouth, N. H., are all well within the path, and should have a good view of the eclipse. Montreal will be just on the edge, as was New York at the time of the eclipse in January, 1925, so that probably people in one part of the city will have a total eclipse, with the sun's corona flashing out for an instant. In the western part of the city, however, there will probably be seen the "diamond ring" effect, observed in lower New York in 1925, when a bit of the sun's edge constantly remained visible. Boston is sufficiently far away from the path that even this will probably be absent, and all they will see will be a very

large partial eclipse, with a crescent of the sun constantly in view. At points farther away, a still smaller partial eclipse will be seen, with a larger crescent of sunlight remaining in view.

## Can Count Atoms

Prof. Henry Norris Russell furnished one of the most important papers from a scientific viewpoint that had been presented to the meeting when he told of the recent work he has been doing at the Mt. Wilson Observatory. He is also a research associate of the Carnegie Institution, which operates it, and his work was done in cooperation with Dr. Walter S. Adams, the director.

The important effects of this work, stated Prof. Russell, are that it is now possible for astronomers to determine the relative number of atoms involved in causing the lines that appear in spectrum photographs of the sun and stars. These lines that appear when the light is passed through the prisms of a spectroscope, have long enabled astronomers to determine the chemical elements in the stars. Strong lines like the yellow one due to sodium and known as the D line, may require a hundred thousand times the number of atoms that give rise to the faintest lines observed, he stated.

With the great spectrograph attached to the 100-inch telescope of the Mt. Wilson Observatory, the largest in the world, these principles have been applied to the stars. This permits an actual confirmation of theories about the stars' atmosphere. He has found for instance, as previously suspected, that the number of atoms in the excited states in hot stars like the sun is greater than in cooler stars like Arcturus or Betelgeuse.

The third important result, he stated, is that the total quantity of material in the atmosphere of a star, that is in the part above the visible

(Turn to page 11)



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# Dr. H. F. Osborn Head of American Association

Additional reports of the Nashville meeting of the American Association for the Advancement of Science, by Watson Davis and Frank Thone, are given here and elsewhere in this issue.

Prof. Henry Fairfield Osborn, president of the American Museum of Natural History, will head the American Association for the Advancement of Science for the coming year.

Prof. Osborn is one of the foremost leaders in vertebrate paleontology in the country. The outstanding position occupied by the American Museum's collection in this branch of science is largely the result of his efforts. The museum halls illustrating the evolution of the mammals and the genealogy of man are famous for their fossil exhibits and mural paintings of the life of early man.

Prof. Osborn has served on the faculties of both Princeton and Columbia but for the last two decades he has been affiliated with the museum and been prominent in the promotion of expeditions into the unknown regions of the interior of Asia that have produced such fossil finds as the widely discussed dinosaur eggs. His own special interest is elephants and mammoths.

A member of the National Academy, he has been the recipient of many honors and medals both here and abroad. He is the author of numerous books and scientific papers, among which the best known to the public are "Men of the Old Stone Age," "From the Greeks to Darwin," and "The Earth Speaks to Bryan."

Thirty-four years ago, when Prof. Osborn read his first paper before the American Association, he was much discouraged by the apparent indifference of his audience. It turned out, however, that among his hearers was the brilliant paleontologist, Waldemar Kowalevsky, who was sufficiently impressed to seek out young Osborn some time after the meeting and assure him of his interest.

"This anecdote," said Prof. Osborn, "illustrates one of the chief advantages of the American Association for the Advancement of Science and of its foster parent, the British Association for the Advancement of Science founded several years earlier, namely, the bringing together of scientists, young and old, from all parts of the world."

On being asked about the program



HENRY FAIRFIELD OSBORN, who will head the American Association for the Advancement of Science for the coming year

of the American Association for 1928, Prof. Osborn said that he had had no opportunity of consulting his colleagues, including the newly elected vice-presidents of the various sections which cover the whole scale of science from higher mathematics and astronomy to the remotest applications of science in sociology, economics and agriculture.

"In general," he stated, "the problem before the association is always twofold, namely, enlightenment of the mass of people and encouragement of the few and advanced specialists in various fields of research."

"In America in recent years this disseminating process has been greatly accelerated by the cooperation of the entire American press. The press is to be congratulated on its honest endeavor to exclude sensationalism and to present abstruse scientific truths so far as possible in the language of the man of the street."

"It is premature," he continued, "even to attempt to forecast what will be the prevailing trend of addresses in various fields of science in the American Association meeting in 1928, but it is safe to assume that vice-presidents of various sections, like Professor Guyer of Wisconsin, Professor Warren of Princeton, Professor Leverett of the U. S. Geological Survey and University of Wisconsin, will present latest aspects of their respective researches in experimental zoology, experimental psychology, glaciology of the northern centennial masses. Amer-

ican scientists lean rather toward presentation of recent discoveries than historical or retrospective treatment chosen in many British association discourses. The location of the coming eightieth meeting of the American Association in New York City will doubtless color some of the addresses which naturally take a trend that may be illustrated by excursions to local centers of geologic, biologic or economic interest."

Prof. Osborn outlined his intention of avoiding scientific controversy of all kinds, stating that controversial spirit arouses emotions and prejudices which prevent clear dispassionate scientific consideration. The subject of his presidential discourse in 1928 will be one of general interest, he declared, but will not be one fanning the flames of past controversies, either in science, religion or philosophy.

To assist Prof. Osborn as president, vice-presidents of the various sections were elected, all of them authorities in their respective fields. Dr. K. C. Archibald, of Brown University, was elected for Section A (mathematics); Dr. P. W. Bridgman of Harvard, Section B (physics); Dr. C. E. K. Mees of the Eastman Kodak Laboratory, Section C (chemistry); Dr. J. S. Plaskett of the Dominion Astrophysical Observatory, Canada, Section D (astronomy); Dr. Frank Leverett, University of Michigan, Section E (geology and geography); Dr. M. F. Guyer, University of Wisconsin, Section F (zoology); Dr. C. E. Allen, University of Wisconsin, Section G (botany); Dr. Fay-Cooper Cole, University of Chicago, Section H (anthropology); Dr. H. C. Warren, Princeton, Section I (psychology); Dr. R. L. Sackett, Penna. State College, Section M (engineering); Dr. A. J. Goldfarb, College of City of New York, Section N (medicine); Dr. C. A. Mooers, University of Tennessee, Section O (agriculture), and Dr. Truman L. Kelley, Stanford University, Section Q (education).

Dr. Arthur H. Compton, of the University of Chicago, was elected to the association's council, along with Austin H. Clark, of the Smithsonian Institution. Dr. John Johnston, chemist of New York, and Dr. David R. Curtis, of Northwestern University, were elected to the executive committee.

## Evolution on New Phase

The evolution theory is entering a new phase, "emergent evolution," that will cause everybody to realize that it vitally affects his personal well being, Prof. William E. Ritter, biologist of the University of California and president of Science Service, declared in an address on the relation between science and the newspapers at the Nashville meeting.

Replacing the emphasis upon the anthropoid origin of man, the rise of races, the origin of species, and other still important and well authenticated portions of the evolution theory, Dr. Ritter foresees prime attention paid to the following three factors:

1. Individual men and women, boys and girls, and even just-born babies are to loom larger in biological science than they have heretofore. It will be realized that nature cares for the individual as well as the race.

2. The doctrine of the fundamental independence and separableness of body and mind is marked for extinction. There is no trace of such a thing as a body independent of a mind or a mind independent of a body. Emergent evolution will go far toward delivering civilization from the nightmare of the materialistic-mechanistic philosophy.

3. Interest will shift from problems of exactly when and how and where man originated to questions of what he is and may become as through-and-through a natural being. The order of nature is truly universal, limitless in space and time, self-adequate and unified from minutest detail to mightiest system. There is neither place nor need anywhere for such a conception as that of the supernatural.

"There is left no trace of doubt," said Dr. Ritter, "about the adequacy of the creative power of the natural order to produce man, not only with all his physical, but with all his spiritual attributes.

"Most vital is the perception that religion based on probably the most powerful and universal of all human emotions, the sexual emotion only excepted, is natural in the same sense that all other emotions are. Much of the best modern thinking seems already to have gone thus far. But the further step, apparently made inevitable by the conception of emergence, is that the religious emotion is a response to the natural order. It does not depend on a supernatural order or even a belief in such an order, as has been so generally supposed. Common interpretation has put the cart before the horse in this as in so many other of man's efforts at interpretation—especially interpretation of his own nature.

"Almost certainly man's belief in the supernatural has resulted from his efforts toward a rational explanation of the peculiar form of his emotion here involved. Even yet the natural order to which this emotion is a response so vastly out-distances his factual knowledge and his powers of scientific generalization concerning it that it is not surprising he should have created, and still hold in imagination, that is to say, should make hypotheses of the existence of bodies and powers quite outside of and beyond the natural order."

Discussing the newspapers of the country and their relation to science, Dr. Ritter declared that the common meeting ground of journalism and science is truth.

"Man has arrived at an unprecedented critical stage in his millennium of effort to make his positive knowledge of himself and of the world contribute in the highest measure to his own good. That stage is marked by nothing less than the necessity of displacing the legendary, mythical, and merely authoritarian knowledge which has constituted his theology by his scientific knowledge of himself and the world, and of accomplishing this without impairing in the least degree anything essential and valuable to the emotional side of his religion. If we grasp this situation fully and resolve to face it squarely we shall see that the chief lack of preparedness of both science and journalism, as of all other educational agencies, is lack of preparedness to grapple rationally

with the two overwhelmingly powerful and pervasive emotional attributes of man's nature, those of his sex and of his religion."

Among the foremost factors that have contributed to the making of civilization today are science and journalism, Dr. Ritter pointed out.

Science News-Letter, January 7, 1928

## Evolution Reaffirmed

Darwin's evolution, under state law ban in Tennessee, was declared "a fundamental phenomenon of life established with a certainty comparable with that of Newton's law of gravitation or of the Copernican conception of the solar system" by the president of the American Association for the Advancement of Science, Dr. A. A. Noyes, in his address opening the meetings.

"While even less can be said today of the processes by which evolution takes place than was thought to be known fifty years ago," said Dr. Noyes, "the fact that evolution has been going on and that many animal types have gone through definite stages of development can only be doubted by an individual who, like an ostrich, buries his head in the sand out of a vague dread that he may see something shocking.

"These advances in science have greatly influenced the philosophic and religious thinking of the scientific men, for it is a great mistake to think the tendency of advancing science is toward materialism. Just the opposite. The repeated discoveries of new and unexpected types of phenomena in the physical world make us realize more than ever the limitations of our understanding and lead us to feel with the poet that 'as knowledge grows from more to more, will more of reverence in us dwell.'"

Science News-Letter, January 7, 1928

(Additional reports on page 7)

## THE SCIENTIFIC HABIT OF THOUGHT

by Frederick Barry

Professor R. A. Schuyler says:  
"I have read a number of popular expositions which purport to make science, or particular sciences, intelligible to the public, but none of them can compare with this either for information or for suggestive power. I suspect that those who judge it critically will find it to be a really remarkable book."

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# Psychologists Told How Monkeys Judge Time

Emily C. Davis reports here some of the important subjects discussed at the Columbus meeting of the American Psychological Association in Columbus during Christmas week.

Two little monkeys whose names for publication are abbreviated to A and P. have assisted a psychologist to demonstrate that monkeys can judge time. They have also shown that if they are typical examples of their kind the feminine monkey has a little better sense of time than the masculine.

The two monkeys learned not to reach for a piece of banana displayed in a tin can, when a sound hammer measured off a second and a half interval just before the can was shown. And they learned to take the banana out of the can when four and a half seconds were sounded off just before the food appeared. Dr. Herbert Woodrow, of the University of Oklahoma, said that after 2,600 trials the female monkey, A, responded correctly in 92.5 per cent. of instances, and after 3,600 trials, monkey P, the male, made a record of 90 per cent. The experiment was conducted for a short time each day, for more than a month.

The monkeys were discouraged from making the wrong response chiefly by scolding, and being told, "No," Dr. Woodrow said. After about five days, monkey A began to bat with her paw on the screen which covered the can while the time interval was sounded. This batting, Dr. Woodrow stated, was quite irregular, but it developed into a habit, so that she batted once or twice during the shorter interval, and much oftener during the longer interval. As a result of being scolded when she reached for the food at the wrong time, this monkey developed a vacillating type of behavior, reaching out and fingering the rim of the can even when she finally decided correctly not to try to take the banana.

Monkey P, towards the last days of the experiment, began to pull at the brown felt on which the food can rested, and after that pulling at the felt became his regular procedure. If the correct response was to take the food, he would pull at the felt and then quickly seize the banana and eat it. If the signal was not to take it, he would pull at the felt and then rest his paws on the bars of the cage.

Chimpanzees have memories, though whether they work like those of human beings is not yet determined. Dr. Robert Yerkes, of Yale, reported that in his latest experiments with four

chimpanzees they remembered for several hours in which of four boxes food would be placed. One of the animals learned to distinguish between boxes of different colors, but this was a more difficult task. The two female chimpanzees markedly outstripped the males in memory, Dr. Yerkes said.

Science News-Letter, January 7, 1928

## Musical Test to Indians

Do Indian children have especial musical ability, any racial heritage from their tom-tom playing and their dancing ancestors? Tests of musical ability which have been given to white children have also been tried on 550 Indian boys and girls of 27 different tribes, by Miss Rachel Isbell, of the University of Denver, and the Indians excelled the white children in some respects.

In pitch and memory the Indian is inferior to the white, Miss Isbell found. In rhythm the Indian children were slightly better than the white, but not enough to be called a racial difference.

In their sense of time the Indian boys were much better than the white children, while the Indian girls were somewhat inferior, Miss Isbell said. This might be explained, she added, on the basis of training, because the Indian men are the ones who take an active part in the ceremonial dances. In intensity and consonance the Indian children rated about the same as the white.

Science News-Letter, January 7, 1928

## Social Intelligence Useful

Success or failure in life is very largely determined by the ability to get along with others, and in no trait do people differ more than in this ability, Dr. Fred A. Moss, of George Washington University, declared.

A test of social intelligence, devised by Dr. Moss, has been given to several thousand individuals. The highest possible score on the test is 160 points, and the highest record so far made is 145, scored by a college boy who expects to go into politics.

Executives who took the test scored the highest as a group in this ability to react intelligently to social situations, Dr. Moss found. The medium, or middle, score for the group of executives was 117. Teachers made 112, salesmen 107, clerks and stenographers 95, sales clerks 81, nurses 78, and low grade industrial workers 65.

Dr. Moss's test measures the in-

dividual's judgment in meeting social situations, his ability to appreciate the mental state back of spoken words and back of facial expressions, his understanding of human motives, and his ability to remember names and recognize faces.

The scores indicate that ability to get along with other people may be developed, unlike mental ability, which is generally believed to be unchangeable. High school students scored only 83 on the test, while college freshmen made 104 points, upper classmen 114, and graduates 116.

Although not designed particularly for that purpose, the test seems to be useful in predicting school success, Dr. Moss said. In many subjects the teacher grades his students largely according to his personal estimate of their knowledge and ability, and in these subjects it is often better to know the instructor and his pet interests than to know the general subject matter of the course, he pointed out. The student who has a keen social understanding, therefore, is likely to make better grades than the one who blunders in understanding and dealing with other people.

Science News-Letter, January 7, 1928

## New Spelling Test

The old-fashioned spelling bee at which supremacy in spelling was fought over and proved by reeling out triple-jointed words can now be replaced by a much simpler ordeal. A new scientific test to measure spelling ability, devised by Dr. J. E. W. Wallin, of Miami University, is described.

A child who possesses marked spelling ability ought to be able to spell phonetic words of increasing difficulty without much instruction after he has mastered the simple mechanics of spelling, Dr. Wallin said, but he might not be able to spell unfamiliar words that are spelled quite differently from the way they sound. Reasoning along this line, he selected a list of 459 words that are spelled just as they sound and had them tried out on more than 5,000 school children from the second to the eighth grades.

A child who can spell correctly all the words in the test that children of his grade usually get is an average speller. If he can spell more difficult words he is a superior speller, and his degree of superiority can be gauged by the extent to which he ap-

(Just turn the page)

## Psychological Meeting

(Continued from page 5)

plies his simple knowledge of spelling to working out the phonetic spelling of longer and unfamiliar words.

General intelligence tests are useful in predicting a child's capacity for general education, Dr. Wallin said, but special tests are needed to diagnose a child's possibilities in each type of learning, and such tests should be given early in the child's school career.

Science News-Letter, January 7, 1928

## Mail Order Psychology

Should psychologists attached to universities give a personal analysis service to clients by mail? This problem was argued at the closing session of the association.

The public is asking for help in developing personality to the best advantage, and reputable psychologists should begin to give this help in a conservative way, was the stand taken by Dr. Forrest A. Kingsbury, of the University of Chicago. Dr. Kingsbury read a paper reporting the establishment of a Personal Analysis Bureau, which gives tests to clients by correspondence, and attempts to show them their personality resources and possibilities. The institution is new and is still in an experimental stage, he said.

Applied psychology has not reached a stage where we can give tests of intelligence and personality by mail with any hope of obtaining a complete picture of an individual, Dr. M. L. Reymert, of Wittenburg College declared. Such an enterprise by professors in responsible positions in European universities would be unthought of.

The Psychological Corporation was organized by prominent psychologists several years ago in order to give vocational and personal assistance of this sort, Dr. C. A. Ruckmick, of the State University of Iowa, pointed out. Members of the corporation handle cases only by direct consultation, as a doctor does, he said.

The entire burden of selecting employees cannot be left to psychology tests, Dr. Sadie M. Shellow, industrial psychologist, of Milwaukee, said, in a paper on the importance of interviewing job candidates. Personality is so complicated that it will probably never be possible to measure it completely by paper tests, she said. An interview with a representative of the firm is a shock absorber, which puts the applicant for work at ease and brings out significant angles of personality not measured by tests.

Science News-Letter, January 7, 1928

## To Repeat Experiments

A successful attempt to confirm some of the experiments of the great Russian psychologist, Pavlov, was reported by Dr. H. S. Liddell, of Cornell. Some of his famous experiments have never been repeated in this country, and some have been tried unsuccessfully. Dr. Liddell used sheep and goats to test principles of neurological excitation and inhibition established by Professor Pavlov on dogs. A nervous disturbance was artificially produced in the animals, and the results verify the Russian's theory of brain function, Dr. Liddell reported.

Science News-Letter, January 7, 1928

## Environment Important

A remarkable investigation indicating that environment plays a bigger part than heredity in making us the sort of individuals that we are was reported before the American Psychological Association by Dr. Frank N. Freeman, of the University of Chicago. Four hundred little children taken from poor and undesirable homes and placed in foster homes were used by Dr. Freeman to test the power of environment to alter mental development.

The heredity of the children was extremely bad, Dr. Freeman said. A large percentage of the fathers and mothers were mental defectives and moral defectives. In spite of their bad start in life, children placed in good types of homes gained on an average ten points in their intelligence quotient, which measures their mental ability. Ordinarily, a child's mental ability remains at its own level, whether he is normal, or superior, or dull. Dr. Freeman's investigation indicates that change of homes may change this development, however. The vast importance of the first years of a human being's life was shown by the fact that children adopted before they were four years old made striking gains in their mental age level, whereas children adopted after four years scarcely changed in this respect. Children who were taken into homes of a poorer type, with few advantages, remained at approximately the same mental level.

Mothers are beginning to worry over the normality of their children, Dr. Florence Mateer, of Columbus, said; and because of this a new kind of psychologic clinic is developed which will help normal children make the most of their possibilities. Out of one hundred average and superior children of pre-school age, all but

eleven had some peculiar individual problem of behavior or mental twist that needed adjustment, she reported. The true test of a normal child is his ability to meet his own problems successfully and quickly, once they are pointed out to him.

Science News-Letter, January 7, 1928

## International Congress Here

The International Congress of Psychology will meet at New Haven in the summer of 1929, it was announced. This is the first time that this important gathering of psychologists has selected the United States as its meeting place. Dr. J. McKeen Cattell, of New York, well-known psychologist and editor of *Science*, will be president of the congress.

Science News-Letter, January 7, 1928

Some ancient warships had 16 banks of oars.

An oyster produces about 50,000,000 eggs.

Red appears to be the first color noticed by a baby.

Prehistoric men in Europe used birchbark for candles.

Diamonds in the world represent a value of probably \$5,000,000,000.

A monoplane with 12 engines which will carry 60 passengers, is being built in Germany.

In the influenza epidemic of 1510, it was said that scarcely a family in Europe escaped the disease.

In the earthquake of 742 A. D., more than 500 towns in Palestine and Asia were destroyed.

When iron was first used in shipbuilding, many people insisted that it could not be expected to float.

The population of Manchuria is only 61 persons per square mile, as compared with 390 in Japan and 301 in Korea.

Canada estimates that each woodpecker is worth \$20 to the country as a means of protecting trees against insect pests.

Increasing crop yields on American farms show that the older farm lands are not wearing out, as has been sometimes stated.



## X-Rays Change Heredity

X-rays played a highly important part in the discussions of the biologists attending the American Association meeting. Within recent months many workers in various parts of the field have discovered this well-known type of radiation to have literally miraculous powers to change the course of events in the development of living organisms, and to leave so deep an impression on their substance that their descendants, even to the last generation, will show the effect of their ancestors' experience.

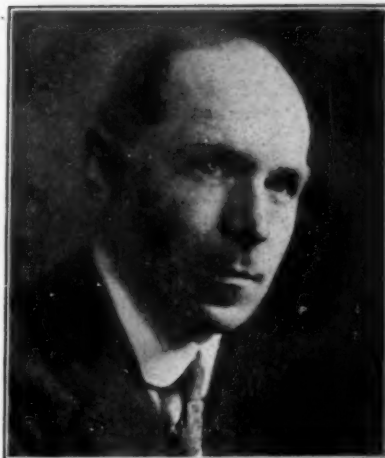
Prof. Winterton C. Curtis and Raymond A. Ritter, of the zoology department at the University of Missouri, told of their researches on the effects of X-rays on the development of growing tissue. They experimented on a small marine animal related to the jellyfishes, which reproduces itself by constantly budding off new individuals very much as a tree produces branches. After exposure to the X-rays for ninety minutes the animals lost the power of producing new individuals, although the original parent portion remained alive.

Prof. H. J. Muller of the University of Texas, who recently startled the scientific world by speeding up evolutionary processes over a hundred-fold with heavy X-ray doses applied to a small insect, the fruit-fly, reported further on his work and displayed specimens showing the results of his technique. Prof. Frank B. Hanson, of Washington University, St. Louis, who has been collaborating with Prof. Muller, reported on the effects of the rays on the rapidity with which the insects reproduce.

It was for his account of this work that Prof. Muller was awarded the \$1,000 Association prize for one of the most notable papers presented at the meeting.

Prof. Robert T. Hance of the University of Pittsburgh told of some of the first results of X-ray experiments on warm-blooded animals. The hair color of mice exposed to very light doses of the rays in his laboratory was radically changed. Normally "mouse-colored" mice of mixed ancestry went completely white after being rayed, while purebred mice of the same color changed in the opposite direction and became darker.

Dr. H. J. Bagg of Memorial Hospital, New York City, and Dr. C. R. Halter, of Cornell University Medi-



PROF. H. J. MULLER of the University of Texas, awarded the \$1,000 American Association Prize

cal College, working in collaboration, were also among the first to obtain positive results with warm-blooded animals. Their mice developed certain marked bodily defects, such as only one kidney instead of two, abnormal eyes, and legs in bad condition at birth. Such defects occur among mice bred under ordinary conditions, but not so often as among X-rayed animals.

Plants as well as animals respond to X-ray treatment. Prof. T. H. Goodspeed of the University of California has obtained results in the breeding of X-rayed tobacco plants which are comparable with those of Prof. Muller on fruit-flies. The new varieties produced in this way have a stronger growth and produce more flowers than their cousins descended from un-rayed parents.

Prof. L. J. Stadler of the University of Missouri has conducted similar experiments with corn and barley. In these, as in all the other animals and plants on which the treatment has been tried, the hereditary units or genes have been knocked out of place and more or less violently rearranged, resulting in forms of life wholly new to the universe.

It is agreed on all sides at the gatherings of scientific men that the past year has been one of revolution in the study of heredity among living things, comparable with 1859, when Darwin published the Origin of Species, and 1900, the year of the rediscovery of Mendel's law.

Science News-Letter, January 7, 1928

Recent studies of little children's vocabularies show that instead of using chiefly nouns, they use more verbs and pronouns, especially "I."

## New X-Ray Property

While the biologists were listening to accounts of newly discovered ways in which X-rays affect living tissue, physicists heard about another new property of these rays. Dr. Fred Allison, of the Alabama Polytechnic Institute at Auburn, Alabama, told the American Physical Society how he had found that they change the effect of certain liquids and other substances on light.

Many liquids, such as a sugar solution, have the property of turning the plane of polarized light. Ordinary light consists of vibration in an indefinite number of directions, but when polarized, the vibration is confined to one particular plane. If a beam of such light is passed through a sugar solution, it is still vibrating in one direction when it emerges, but in a different direction from that when it went in.

Dr. Allison has found that even liquids which do not ordinarily have this power gain it when exposed to X-rays. When liquids, or glass, are placed in the field of a powerful magnet, they gain this property, as discovered many years ago by Faraday. When X-rays are used in addition, says Dr. Allison, the rotatory powers of the liquids are increased, while in glass, it is made to rotate in the opposite direction.

Science News-Letter, January 7, 1928

## X-Rays from Gases

"X-rays" obtained when high speed electrons hit atoms of gases, were one of the important new tools in physics described at the Nashville meeting by Prof. William Duane, of Harvard University. Prof. Duane delivered the address in relinquishing his office as Vice-President of the section on physics.

The subject of Prof. Duane's address was "The General Radiation," which he described as one of the two kinds of radiation given off when an electron hits an atom. The other kind is the line spectra, which are confined to certain particular wavelengths. In contrast, the general radiation covers a long band of wavelength, and carries much more energy than the line spectra.

Ordinary investigations of X-rays have been confined to those generated by electrons, which are the particles of which electricity is supposed to consist, when they hit solid matter. In the ordinary X-ray tube, a target of some heavy metal such as tungsten is used for them to hit. Investigations have been made

(Just turn the page)

### X-Rays from Gases

(Continued from page 7)

where they hit atoms of mercury vapor, and from which he has drawn conclusions of importance in modern physical theories.

"Although no completely satisfactory theory has been proposed for the radiation problem in general," he said, "it may be that we are gradually approaching a solution of it. A number of interesting physical theories have been proposed in recent years. A physical theory, however, does not represent what we might call real truth.

"A physical theory is a collection of fundamental hypotheses and general laws, which may be used to deduce particular laws that can be applied to concrete facts. Physical theories are useful, if they explain a large number of facts in simple ways, and if they furnish definitions of terms and a nomenclature to be used in describing phenomena.

"Physical theories are tools and not creeds, but one is at liberty to believe they represent reality, if one wants to. The belief in a physical theory, however, is a similar process of thought to the belief in religious tenets.

"The greater the number of useful physical theories that are proposed, the greater the number of good tools we shall have at our disposal, to use in discovering the real truth about the way in which nature acts."

Science News-Letter, January 7, 1928

### Coating Helps Electrons

How a thin layer of atoms of caesium on the filament helps the vacuum tube of a radio set to work better was described by Dr. J. A. Becker, of the Bell Telephone Laboratories in New York. Dr. Becker told of work that he had done in collaboration with D. W. Mueller, of the same Laboratories.

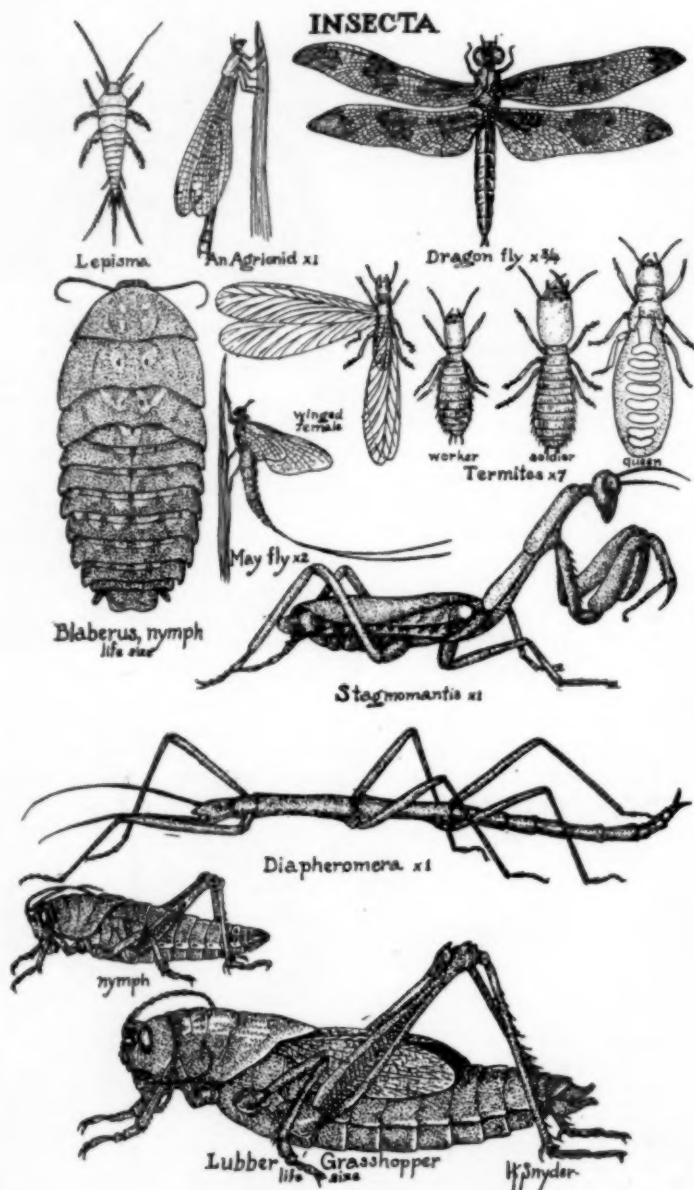
The operation of a radio tube, he explained, depends on the copious emission of electrons from the hot filament. When coated with caesium, in the form of caesium oxide, the atoms of the metal arrange themselves over the filament in a single layer. But the atoms are ionized, which means that each of them has lost one of its quota of electrons, and so is positively charged. This atomic layer is then able to act in the same way as the grid of the tube, but being so close to the filament is particularly efficacious in pulling the electrons out of the tungsten of which it is made.

Science News-Letter, January 7, 1928

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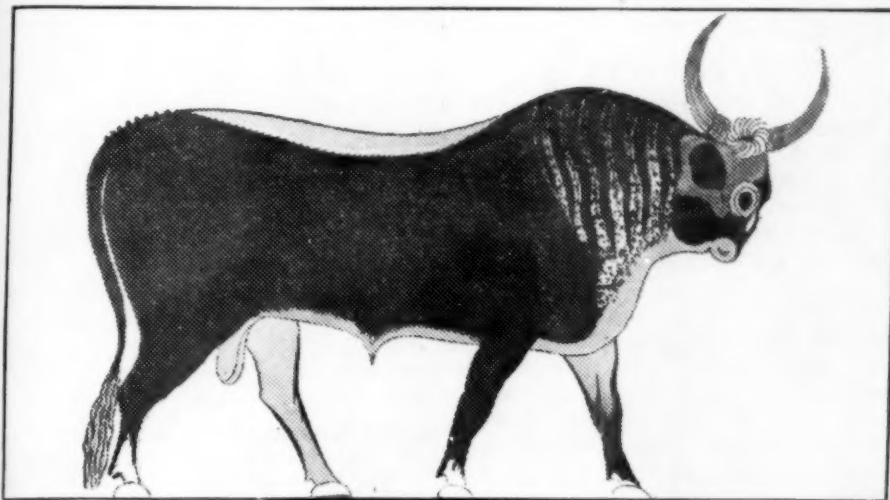
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## Classics of Science:

## Discovery of the Serapeum



*Painting on an Egyptian tomb of an Apis, one of the sacred bulls buried in the Serapeum*

The following account of one of the earliest discoveries in Egyptology by its first scientific explorer shows the finds which it was possible to make there in 1850, something of the attention to detail which an explorer needs, and something too of the personality which made Mariette successful in the face of many and varied difficulties.

**THE MONUMENTS OF UPPER EGYPT**, a translation of the *"Itinéraire de la Haute Egypte"* of Auguste Mariette-Bey by Alphonse Mariette, London, 1877.

### The Serapeum

The Serapeum is one of the edifices of Memphis rendered famous by a frequently quoted passage of Strabo, and by the constant mention made of it on the Greek papyri. It had long been sought for, and we had the good fortune to discover it in 1851.

Strabo, in his description of Memphis, expresses himself thus: "One finds also (at Memphis) a temple of Serapis in a spot so sandy that the wind causes the sand to accumulate in heaps, under which we could see many sphinxes, some of them almost entirely buried, others only partially covered; from which we may conjecture that the route leading to this temple might be attended with danger if one were surprised by a sudden gust of wind."

If Strabo had not written this passage, in all probability the Serapeum would to this day lie buried under the sands of the necropolis of Sak-karah. In 1850 I had been commissioned by the French Government to visit the Coptic convents of Egypt,

and to make an inventory of such manuscripts in Oriental languages as I should find there. I noticed at Alexandria, in M. Zizinia's garden, several sphinxes. Presently I saw more of these same sphinxes at Cairo, in Clot-Bey's garden. M. Fernandez had also a certain number of such sphinxes at Geezeh. Evidently there must be somewhere an avenue of sphinxes which was being pillaged. One day, attracted to Sakkarah by my Egyptological studies, I perceived the head of one of these same sphinxes obtruding itself from the sand. This one had never been touched, and was certainly in its original position. Close by lay a libation-table, on which was engraved in hieroglyphs an inscription to Osiris-Apis. The passage in Strabo suddenly occurred to my mind. The avenue which lay at my feet must be the one which led up to that Serapeum so long and so vainly sought for. But I had been sent to Egypt to make an inventory of manuscripts, not to seek for temples. My mind, however, was soon made up. Regardless of all risks, without saying a word, and almost furtively, I gathered together a few workmen, and the excavation began. The first attempts were hard indeed, but, before very long, lions and peacocks and the Grecian statues of the dromos, together with the monumental tablets or stelæ of the temple of Nectanebo, were drawn out of the sand, and I was able to announce my success to the French Government, informing them,

*(Just turn the page)*

## Study of Quake Risk Urged

An immediate investigation of the earthquake situation in the Mississippi Valley was urged here this afternoon by Commander N. H. Heck, in charge of the seismologic work of the U. S. Coast and Geodetic Survey.

Calling attention to the fact that one of the great earthquakes of all history occurred in the New Madrid region of the Mississippi Valley in 1811-12, Commander Heck intimated that there was a possibility that history would repeat itself, although it can not be foretold what the future will bring. Occasional minor earthquake shocks have been felt in the Mississippi Valley and along the Ohio River in past years and one of the sharpest of these shocks was on April 9, 1917. Another occurred at the time of the great Mississippi flood. Probably the fact that flood and earthquake came at the same time was merely a coincidence that serves to call attention to the damage that would be done by a major earthquake in that region today.

"Thorough examination of the situation in the entire Middle Western region subject to earthquakes is desirable," Commander Heck said. "There is little doubt that the first investigation should be confined to the area surrounding the New Madrid region. Dr. James B. Macellwane, S. J., director of the Jesuit Seismological Association, has proposed such a plan, and it is endorsed by Dr. Arthur L. Day, chairman of the Advisory Committee of Seismology of the Carnegie Institution of Washington, who is in charge of the earthquake investigation in California which is being made with the cooperation of the national government, various state institutions, including the universities, various other groups and the citizens of California. This organization has all that it can take care of in the California problem and the Government activity as carried on by the United States Coast and Geodetic Survey is fully occupied with taking care of earthquake information for the United States and the regions under its jurisdiction, and operating its own observatories so that it is left for the Middle West to work out its problem. Its rapidly growing cities make it important that this problem be attacked.

Earthquakes are due to sliding continents afloat upon viscous layers of rock deep within the earth, Frank B.

*(Just turn the page)*

### Quake Study Urged

(Continued from page 9)

Taylor, geologist of Fort Wayne, Ind., told the Geological Society of America recently.

Many students of earthquakes have noted that most of these earth disturbances are concentrated in the areas, such as those circling the Pacific Ocean, in which young or relatively recent Tertiary mountains were built.

Mr. Taylor has found that most of the world-shaking earthquakes have their centers not on the land where the mountains were born but out at sea where the continental land mass slopes downward to join the sea bottom.

"If the mountain ranges of the Tertiary belt," Mr. Taylor said, "are being made by a sliding of the continental crust sheets from high toward lower latitudes, it is easy to see how stresses would be set up in the compression belt, and would cause earthquakes when they were relieved by sudden fracture or slipping. The whole mass of North America north and northeast of the Rocky Mountains is sliding constantly southward and southwestward, without perceptible jar, on a deep seated basal film or layer of rock which is made potentially viscous by great vertical pressure and by heat, but is made actually viscous only in a relatively thin layer by the tremendous power of the added horizontal stress arising from the main crustal movement.

"Where the basal thrust-planes emerge in the ocean bed beyond the shore of the front range, suboceanic earthquakes are produced. Nearly all major earthquakes are caused in these ways. Only a few are caused by sudden fracture and relief of tension in high latitudes. The process is the same in all of the moving continents: the body of the continent slides without a jar. Earthquakes occur only where the basal planes emerge through the non-viscous, fracturable crust.

"Although Africa is the second largest of the continents, it is not moving horizontally, and hence has remarkably few earthquakes. Asia, which is the largest of the moving continents, and moves at the highest rate, has more intense and constant seismic disturbances in its Tertiary belt than any other continent."

Science News-Letter, January 7, 1928

An international shorthand system has been devised by a German professor.

### The Serapeum

(Continued from page 9)

at the same time, that the funds placed at my disposal for the researches after the manuscripts were entirely exhausted, and that a further grant was indispensable. Thus was begun the discovery of the Serapeum.

### The Excavation

The work lasted four years. The Serapeum is a temple built without any regular plan, where all was conjecture, and where the ground had to be examined closely, inch by inch. In certain places the sand is, so to speak, fluid, and presents as much difficulty in excavating as if it were water which ever seeks its own level. Besides all this, difficulties arose between the French and the Egyptian Governments, which obliged me several times to discharge all my workmen. It was owing to these circumstances (to say nothing of other trials) that the work proved so long, and that I was compelled to spend four years in the desert—four years, however, I can never regret.

Apis, the living image of Osiris revisiting the earth, was a bull who, while he lived, had his temple at Memphis (Mitrahenny), and, when dead, had his tomb at Sakkarah. The palace which the bull inhabited in his lifetime was called the Apieum; the Serapeum was the name given to his tomb.

As far as we can judge by the remains found during our researches, the Serapeum resembled in appearance the other Egyptian temples, even those which were not funereal in their character. An avenue of sphinxes led up to it, and two pylons stood before it, and it was surrounded by the usual inclosure. But what distinguished it from all other temples was that out of one of its chambers opened an inclined passage leading directly into the rock on which the temple was built, and giving access to vast subterranean vaults which were the Tomb of Apis.

### The Ruins Discovered

The Serapeum, properly so-called, no longer exists, and where it stood there is now nothing to be seen but a vast plain of sand mingled with fragments of stones scattered about in indescribable confusion. But the most beautiful and interesting part of the subterranean vault can still be visited.

The third part is that which is now so well known. Its history begins with Psammetichus I. (XXVI<sup>th</sup> dynasty), and ends with the later

Ptolemies. . . . These galleries cover an extent of about 350 metres, or 1,150 English feet; and from one end to the other the great gallery measures 195 metres, or about 640 English feet. Moreover, granite sarcophagi have been used here. Their number throughout the whole extent of the galleries is 24. Of these only three bear any inscription, and they contain the names of Amasis (XXVI<sup>th</sup> dynasty), Cambyses and Khebasch (XXVII<sup>th</sup> dynasty). A fourth, with cartouches without any name, most probably belongs to one of the last Ptolemies. As to their dimensions, they measure on an average 7 feet 8 inches in breadth, by 13 feet in length, and 11 feet in height; so that, allowing for the vacuum, these monoliths must weigh, one with the other, not less than 65 tons each.

**August Ferdinand Francois Mariette** was born February 11, 1821, at Boulogne, France, and died January 19, 1881, at Cairo, Egypt. He began teaching at the age of eighteen, but soon became interested in archæology. The deciphering of Egyptian inscriptions had been going on since Thomas Young and J. F. Champollion had worked out the characters of the hieroglyphic writing from the Rosetta stone, discovered in 1799. Mariette here tells of his mission to Egypt to buy up ancient papyri, and what came of it. Henceforth the life of the Egyptians was studied not only from their writings, but, at first from their temples and monuments under Mariette, later, under Sir Flinders Petrie, from the articles of every day use which have been found. From 1858 Mariette made his home in Cairo, and worked unceasingly to, literally, dig up the history of his adopted land. Bey was Mariette's title under the native government.

Science News-Letter, January 7, 1928

All fish, and trout in particular, are cannibals.

Ancient physicians believed that use of honey prolonged life.

There are less than 8,000 Chinese women in the United States.

Tussah silkworms feed on leaves of dwarf oak trees in eastern Manchuria.

Beavers can profitably be raised for fur in a controlled if not fully domesticated state.

A camera that takes slow motion pictures of automobile engines has been invented.

A new breed of sporting dog is the wire-haired daschund, which has been developed in Germany.



**Astronomical Meeting***(Continued from page 2)*

surface, can be determined. In a star such as Betelgeuse the bright northern member of the Constellation of Orion, which now shines in the southeastern evening sky, there is two hundred times as much stuff as in the sun's atmosphere. And as this atmosphere is much less than that of the sun, it must be much deeper, perhaps many hundreds of thousands of miles. There is also evidence that the chromosphere, the outer layer of the star, is much more extensive in these giant stars than in the sun.

**Einstein Substantiated**

Another objection to the validity of Einstein's theory of relativity was effectually disposed of when Dr. Ross W. Marriott told of measurements made by him and Dr. John A. Miller of the moon's diameter during a total eclipse of the sun. Einstein predicted that light from a distant star, when passing close to the sun, would be bent slightly towards it. Stars near the sun can only be photographed when its brilliance is obscured by the moon coming in front of it, as in a total eclipse. Photographs made at various eclipses have shown that the stars near the sun actually were closer together than would have been expected.

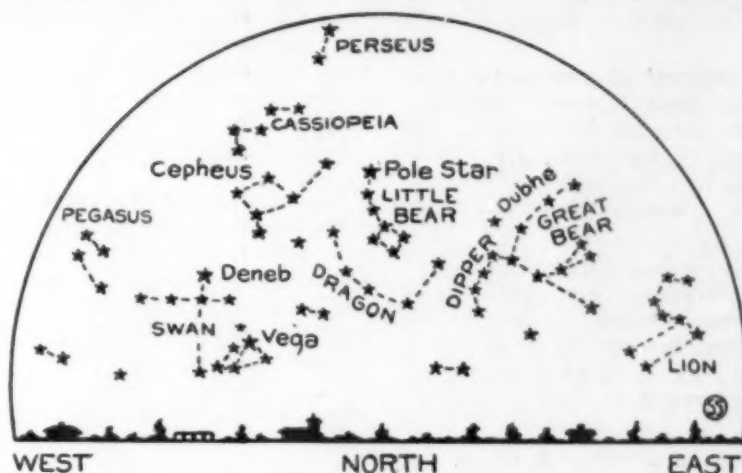
A few years ago Dr. Charles Lane Poor, of Columbia University, made the suggestion that this was caused by the star's light entering the cool shadow of the moon in the atmosphere of the earth. He suggested that this could be checked by measuring the diameter of the moon during an eclipse as compared with its diameter at other times, if it was due to such a cause the moon would be similarly effected. After a long series of measurements, Drs. Marriott and Miller have found the moon's diameter during an eclipse to be precisely the same as at other times, thus substantiating Einstein.

**Elected Honorary Member**

One of the world's champion discoverers of comets and tiny planets was honored by the society when they elected Dr. Max Wolf, of Heidelberg, Germany, to honorary membership. Only foreign astronomers of great eminence are thus honored by the society.

**House Bought with Comets**

How the "greatest astronomical observer of his generation," as the late Edward Emerson Barnard is called, (Just turn the page)

**Dog Star Has Many Claims to Fame**

By JAMES STOKLEY

The nearest naked eye star ordinarily seen from the United States; the brightest of all the stars, except the sun; a star with a close satellite made of the densest known stuff in the universe; the star which to the ancient Egyptians foretold the annual inundation of the Nile and the star which has provided important evidence in favor of the validity of the theory of relativity—any one of these things would seem to make a star of some interest.

But it happens that all this is true of one star, and a star that is now with us in the evening sky. Go outside tonight, if it is clear, and look over to the southeast. The brightest star there is Sirius, the "dog star," that has all these claims to fame.

**Is Nearest Star**

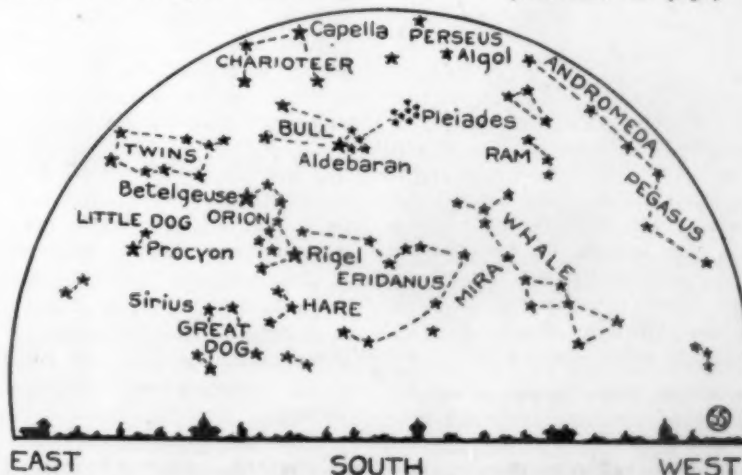
There are two other stars which rise above the horizon for people in the United States, and which are nearer than Sirius, but they are too faint to be seen except with a tele-

scope. One of these is called Lalande 21185, after its number in Lalande's star catalog. It is in the constellation of Leo Minor. The other, known as Barnard's proper motion star, because of its extremely great speed across the heavens, is in the constellation of Ophiuchus, the Serpent Bearer. Perhaps there are one or two other faint stars as close, which have not yet been identified.

However, at present we are concerned with Sirius. Measured in the popular measuring stick of the astronomer, it is 8.67 light years from us.

It is principally on account of its closeness that Sirius appears so bright to us, for it would appear only 26 times as brilliant as the sun, if both could be viewed from the same distance.

In recent years, the so-called "companion of Sirius" has claimed a large amount of attention in the astronomical world, even though it

*(Just turn the page)*

HOLD THESE MAPS in front of you and they portray the northern or southern evening sky in January

## Dog Star Has Claims to Fame

(Continued from page 11)

is so faint that a large telescope is required to reveal it. It was over 75 years ago that the presence of such a companion was found though not for some years later was it actually seen.

### Influenced by Gravity

When two heavenly bodies, no matter how far distant, revolve around each other, they do so under the same influence of gravitation that pulls a stone to the earth. And just as the military engineer, for example, can calculate the exact way in which gravitation affects the projectile from a big gun, the astronomer can calculate the influence of gravitation between these two stars, far out in space. He can see the paths they take. From this he can figure out the mass of each. And when he does, he finds the curious fact that though the faint companion of Sirius is only 1/10,000 as bright as its big brother, it is two-fifths as massive.

One of the latest chapters in the history of the companion of Sirius has been written within the past few years. It seemed, theoretically, as if the companion should be exceedingly dense, far more than lead or mercury or other dense terrestrial elements. The density of a substance depends on its mass and volume—the mass was known, but with a body as small and as distant as this, there is little hope for measuring the diameter, and hence the volume.

### Einstein's Answer

Here the theory of relativity appears in the picture. If light waves start from a body in which gravitation is very strong, because of great density, they should be slowed a little by the pull in leaving. If the light from such a dense glowing body is broken up into the colored spectrum by a spectroscope, the lines which cross it should be a bit nearer the red end than in the light from a similar glowing body on the earth. Such a shift, though very small, was found in the light from the sun. In a very dense star, such as the companion appeared to be, it should be perhaps twenty or thirty times as great.

With the 100 inch Mt. Wilson telescope, the largest in the world, Dr. Walter S. Adams succeeded in photographing the spectrum of the companion, in itself a difficult procedure. In these photographs the shift was very close to that predicted by Einstein's theory. It

showed the diameter of the star to be about a thirtieth that of the sun, or about 30,000 miles. Thus was furnished at the same time strong evidence in favor of the relativity theory, as well as in favor of the theory of the stars. In other words, as has been said, it was a case of killing two birds with Einstein.

### Densest in Universe

Its diameter so small, and its mass so great, the density of the companion is inconceivably great. A pint of water weighs about a pound, according to the old proverb; a pint of lead about eleven and a half pounds, a pint of mercury about 14 pounds, but a pint of the stuff of which the companion is made, if we could obtain it, would weigh about 25 tons!

Professor A. S. Eddington, of Cambridge University, has shown how this can be possible. According to his ideas, the atoms in the star are broken up. Ordinary atoms are supposed to consist of a structure similar to the solar system, with a "proton" taking the place of the sun, and electrons of the planets which revolve around it. Thus there is a limit to the closeness with which they can be crowded together, and the density of ordinary matter. But in the companion of Sirius the atoms are undoubtedly greatly ionized, which means that most of the outer planets of the atomic system are loose, and floating around freely. The remaining central part is so much smaller than the original atom that far more can be crowded together, and such great densities can be attained. But as yet there seems to be no way of imitating this process on the earth, and we cannot hope to have paper weights made of the stuff.

### Other Stars

So when you see Sirius tonight blazing in the southern sky, remember that there is more to it than appears to the naked eye. Above Sirius and to the east is its neighbor, Procyon, in the Little Dog, and which is also accompanied by a dense companion. The constellation of Orion shines to the west of Sirius, while overhead is Capella. The heavenly twins, Castor and Pollux, appear below to the southeast. Over in the east is Regulus, at the bottom of the handle of the sickle, part of Leo, the lion. No planets are visible in the evening sky this month, though Venus is still in the eastern sky before sunrise.

Science News-Letter, January 7, 1928

## Bought House with Comets

(Continued from page 11)

sidered, once bought a house in Nashville by discovering comets was described by Dr. R. G. Aitken. Dr. Aitken, who is in charge of the Lick Observatory of the University of California, delivered an address as retiring vice-president of the astronomical section of the American Association.

Taking Dr. Barnard, who was a native of Nashville, and whose astronomical career largely began at the previous meetings of the Association at Nashville in 1877, as the subject of his address, Dr. Aitken related many personal reminiscences.

"On September 17, 1881, he found a comet," said Dr. Aitken, "and he sent word of the discovery to Lewis Swift, and through him to astronomers generally. This comet was therefore carefully observed and is known, in the annals, as Comet 1881 VI. This discovery had important consequences quite other than its bearing upon his reputation as an observer. Mr. H. H. Warner of Rochester, New York, had offered a prize of \$200 for each unexpected comet discovered by an American observer. This prize came to Barnard for the discovery of Comet 1881 VI; Mrs. Barnard felt that the money must be used for some definite purpose, and with her encouragement, and faith that later payments would be met 'somehow,' and that they would 'manage,' it was accordingly used as the first payment for a house. Faith backed by hard work had its due reward, for Mr. Warner's offer was continued for several years, and Barnard actually won enough prizes for cometary discoveries to pay for the 'Comet House,' as it is still known here in Nashville and to all astronomers."

Upon the founding of the Lick Observatory in 1887 Barnard, then at the age of 30, joined its staff. Later he went to the Yerkes Observatory, in Wisconsin. Among the many important discoveries which he made, said Dr. Aitken, were those of the fastest moving known star, and also the second closest, the first moon of Jupiter to be found since 1610, the "Gegenschein" or faint glow of light that appears in the sky opposite the sun, as well as numerous comets and double stars. As a great astronomer, concluded Dr. Aitken, Barnard was "honored by astronomers throughout the world. Barnard, the modest, simple-minded, unselfish, kindly man was loved by everyone who knew him."

Science News-Letter, January 7, 1928



## Trees Contain Air

The microscopic tubes in the sapwood of trees, commonly assumed to be wholly devoted to carrying water upward to the leaves, are to a large extent simply air reservoirs. Moreover, the air-containing tubes are not merely scattered at random, but have a definitely zoned arrangement which differs in different species of trees. Researches leading to these conclusions, conducted by Dr. D. T. MacDougal of the Carnegie Institution of Washington, Prof. J. B. Overton of the University of Wisconsin and Prof. G. M. Smith of Stanford University, were reported before the meeting of the Botanical Society of America in Nashville.

The three researchers investigated the way wood carries water by injecting a red dye into various kinds of trees and either letting the natural suction of the leaves pull it up, or pulling it up themselves with a vacuum pump, or else driving it up with a force pump. When the suction applied was light, the colored water travelled up the trunk in the natural way, and of course did not enter the tubes that were blocked with air. The zone of travel was thus clearly marked with red. When violent pressure or suction was applied the air was driven out, and the water traveled through the whole available space, blotting out the zonation.

By these means it was found that in willow the sap stream passes exclusively through wood formed late in the summer, in alder it is in early spring wood only, and in walnut it passes through the inner and outer face of an annual ring.

Science News-Letter, January 7, 1928

## AGRICULTURE

### Paper Carpet in Gardens

Crop increases of five and six hundred per cent. following the use of a "magic carpet" of heavy waterproof paper, covering all the ground not actually occupied by the stems of the plants themselves, were reported by Dr. L. H. Flint of the U. S. Department of Agriculture, before the meeting of the Botanical Society of America, in Nashville.

The system is known as "paper mulching," and was first practiced on tropical pineapple plantations. It worked there, and the experiments were then made to see whether it might not be beneficial for various garden crops in a temperate climate. Dr. Flint carried on his researches for three years before he was ready to report on them.

(Just turn the page)

## Fruit Pest Eradicated

The prospects are good for ousting from the United States the Mexican fruit worm, a serious menace to the entire fruit industry of the South, according to Dr. A. C. Baker, in charge of subtropical insect investigations at the U. S. Bureau of Entomology.

This insect is one of the worst pests of tropical fruit in North and Central America, Dr. Baker stated. It was discovered in this country first in April in grapefruit in the lower Rio Grande valley in Texas. Steps were immediately taken to eradicate it and a thorough clean-up of all fruits known as hosts was instigated and carried out during the summer. A quarantine was placed on the Rio Grande valley, which was divided into inspection districts based on the areas of known infestation.

Thorough inspection of this season's crop has been made every thirty days, Dr. Baker declared, while only fruit from groves known to be free of the pest is allowed to move in interstate trade.

The results from this vigorous campaign have been very encouraging, Dr. Baker stated, in the light of the fact that whereas the infestation was distributed throughout the entire valley this spring, not a fruit worm has been found in this season's crop.

Science News-Letter, January 7, 1928

## ENTOMOLOGY

### Europe's War on Insects

A new style of chemical attack on insect pests of forest and orchard trees which may partly or wholly replace the time-honored but expensive methods of spraying and dusting, is described by Dr. L. O. Howard, chief of the bureau of entomology of the U. S. Department of Agriculture. He saw it being tried out during his stay in Europe last summer.

The method was developed by chemical warfare technicians, who wished to turn their military talents to use in the arts of peace. The materials used resemble somewhat the "smoke candles" used to generate a smoke screen in wartime, except that the fumes given off by these peacetime chemical smudges contain arsenic.

In some places the arsenic smokes are set on the ground at intervals, and in others they are carried through the grove or orchard on long poles by a rank of men. In either case they fill the air with a white fog, which takes about an hour to settle. At the end of that time an examina-

(Just turn the page)

## World Well in 1927

The people of the United States have stayed in good health at home and have been successful in keeping out the major plagues from abroad, according to the annual report just submitted to Congress by the Surgeon General of the U. S. Public Health Service.

International public health organization now makes it practicable for different countries to keep informed of the progress of epidemics, if any, throughout the world. The increased facility of communication of modern times is of great importance in preventing the introduction of dangerous communicable diseases from abroad. No cholera, for instance, yellow fever, nor bubonic plague gained access to the United States during the current year.

Up to June 30, 1927, health conditions throughout the world were better than for any previous year on record. The influenza epidemic is considered responsible for the larger number of deaths in Europe during the latter half.

India continues to remain the principal seat of infection for bubonic plague and Asiatic cholera. The devastating epidemics of typhus fever which swept Russia after the World War seem to have definitely passed, though the disease remains endemic in that region.

Modern sanitary science has practically confined yellow fever, once the scourge of the southern states, to one section of the continent of Africa. One case at Bahia, Brazil, was reported in the Western Hemisphere this year.

"The death rate for all causes for the calendar year 1926 in 28 States," declared the Surgeon General, "was 12.1 per 1,000 population. This was slightly higher than the rate for 1925, which was 11.7. The increase was probably caused principally by the large number of deaths from respiratory diseases. This country escaped the epidemic of influenza which swept over Europe during the winter of 1926-27, and the few cases reported here were mild. Typhoid fever declined during the calendar year 1926, and the case and death rates for the year were the lowest ever recorded. This disease showed a small increase, however, during the first part of 1927. The general downward trend in diphtheria is undoubtedly the result of the use of antitoxin and toxin-antitoxin immunization.

(Just turn the page)

## World Well in 1927

(Continued from page 13)

"The death rate from tuberculosis continued its decline, and heart disease, diabetes, and nephritis, which had been increasing in recent years, showed lower rates than were expected."

Smallpox decreased during the calendar year 1926. In most sections of this country the disease was of mild-type, but in some localities it existed in severe form. In view of the demonstrated protective value of vaccination, the Surgeon General says that it is difficult to explain why this simple preventive measure is not universally employed.

The geographical prevalence of tularaemia, a disease identified a few years ago by an investigator of the Public Health Service, was discovered during the year to extend to 10 additional States, increasing the area of known distribution of this new disease to 36 States, the District of Columbia, and Japan.

Rocky Mountain spotted fever is another disease being studied by the Public Health Service, the knowledge of the area of prevalence of which is being extended. This disease, originally reported by only two Western States, was reported last year from nine States.

Science News-Letter, January 7, 1928

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## Europe's Insect War

(Continued from page 13)

tion of the leaves shows that they are covered with a thin deposit of arsenical residue. Results are not all in from the first experiments, but if the new method is effective against the insects its cheapness and quickness of operation will be strong arguments in favor of its general adoption.

The warfare now being waged against forest insects in many parts of the world, by means of airplanes that swoop over the trees scattering clouds of poison dust in their wake, received a dramatic justification in Czechoslovakia.

During his recent European tour Dr. Howard was shown a tract of spruce woods in Czechoslovakia. This forest was divided into three parts, one of which was owned by the government, one by a wealthy nobleman, and the third by a neighboring city. When it was proposed to dust the forest from an airplane to check the ravages of the destructive nun moth, the government and the owner of the private estate agreed to assume their share of the cost, but the municipality refused to spend the money. The aviator therefore dusted the portions of the forest for which protection had been provided, and left the municipal forest untreated.

At the end of the past season the results of the divergent policies became apparent. The government and private parts of the forest were in thriving and healthy condition, whereas the municipal forest fell a victim to the false economy of the city fathers, and is now practically ruined by the moths. It will have to be cut down and sold for paper pulp at a fraction of its value.

The thorough-going Teuton has developed a scientific method of crossing a bridge before you come to it.

There is in Germany a new and well-equipped laboratory for the study and combat of the European corn borer, which is working costly havoc on the eastern border of the American corn belt.

Dr. Howard knew that corn had never been raised in Germany to any extent, and the laboratory seemed to be a sheer case of borrowing trouble. He asked a German fellow-scientist about it.

"No, we do not have much corn as yet," was the answer; "But you see we are about to begin cultivating it on a large scale in this country. Of course, when we do we shall have to contend with the corn borer, and we think it is well to get a head start while we can!"

Science News-Letter, January 7, 1928

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## Paper Carpet

(Continued from page 13)

He tried the paper mulch on a great variety of garden crops, and all but one of them responded with heavily increased yield. The increases during the 1927 season varied from 11 per cent, with garden peas to 516 per cent, with spinach. The crop of lettuce was more than doubled, that of green corn was trebled, and that of potatoes almost quadrupled.

According to Dr. Flint the paper mulch results in an increase in soil temperature, a reduction in the loss of soil moisture and a modified distribution of water. All three of these factors are favorable to plant growth under usual summer climatic conditions. A further effect of the blanket of paper over all unoccupied soil spaces is to smother all weed growth.

Science News-Letter, January 7, 1928



## First Glances at New Books

**AMERICAN ANNUAL OF PHOTOGRAPHY**—Edited by F. R. Fraprie and E. J. Wall—*American Photographic Publishing Co.* (\$1.50). In this, the 42d volume of a classic photographic work, the standard of previous years is well preserved. Of particular interest to scientific readers are the articles by Dr. Wightman on the latent image, one by Dr. Wightman and Dr. Trivelli on photomicrography, the latter with some splendid illustrations, and one by Dr. Wall on water as a chemical. Dr. Wall also reviews the year's work in photographic technique. The numerous illustrations, examples of modern pictorial photography, are of interest to all.

Science News-Letter, January 7, 1928

**OUR TIMES**—Mark Sullivan—*Scribner's* (\$5). The social evolution of *Homo americanus* during the past quarter-century. There is certainly no other species that has ever changed its habits so much in so short a time.

Science News-Letter, January 7, 1928

**ZWEITE SAMMLUNG ASTRONOMISCHER MINIATUREN**—Elis Ström-gren and Bengt Ström-gren—*Berlin: Julius Springer*. A group of brief papers from the director of the international clearing house for astronomical discoveries.

Science News-Letter, January 7, 1928

**WHITE LEAD**—International Labour Office at Geneva—*World Peace Foundation* (\$2). Data collected by the International Labour Office in regard to the use of white lead in the painting industry.

Science News-Letter, January 7, 1928

**ANNUAL REPORT OF THE SECRETARY OF LABOR, 1927**—*Government Printing Office*. Secretary Davis presents the status of labor for the fiscal year ending June 30, 1927.

Science News-Letter, January 7, 1928

**ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR, 1927**—*Government Printing Office* (40c). Secretary Work tells of the year's activities in this most diversified of the Government departments.

Science News-Letter, January 7, 1928

**THERMIONIC PHENOMENA**—Eugène Bloch—*Dutton* (\$2.50). With the development of modern radio technique that has been made possible by the emissions from hot filaments, thermionic phenomena have assumed an importance they never before enjoyed. Here is a brief, but complete, treatise on the theory and application of the subject.

Science News-Letter, January 7, 1928

## BIOLOGY

### NATURE RAMBLINGS

By FRANK THONE



Geranium

Of all the bright flowers that can be raised indoors to keep us cheerful while we wait for spring to return, none is more easy to raise than the old-fashioned favorite, the geranium. The geranium can get along with almost any kind of soil in any kind of a pot, on any kind of watering short of none at all. It roots readily from cuttings, and grows at a pace that would make it a noxious weed if it were capable of withstanding outdoor conditions during the winter. And it comes into bloom readily and copiously, with bright, sturdy colors, predominantly red. A very comfortable, thrifty, bourgeois sort of a plant.

The geranium of our indoor gardens, however, is really parading under a half-stolen name. By rights the title belongs to the wild geranium of the woods, and to its wild European relative, which was known to the Greeks many centuries ago. Geranium is a Greek word, and means a crane. The name was given to the plant because of its slender, pointed seed pods.

Our indoor geraniums, to be sure, are related to those true, "cranesbill" geraniums; but they were not known in Europe until after the early exploration and settlement of South Africa, their native home. Even their seed pods show the kinship, for they also are sharp and pointed, though not so slender as those of the wild geraniums. Hence the plant has been christened "Pelargonium," which means "stork-bill." But for ordinary familiar purposes the Pelargonium will be a Geranium still.

Science News-Letter, January 7, 1928

How a whale can stay below water at great depths without discomfort from the great pressure has never been understood.

Sea bathing was recommended in 1795 as a cure for goiter, with a diet of "salted fish and vegetable acid, particularly cyder."

## ZOOLOGY

### Feathers Depend on Skin

When a piece of skin from a White Leghorn chicken is grafted on a grey Barred Plymouth Rock, the grafted section of epidermis continues to bear white feathers even in its new surroundings.

This discovery, made by Prof. C. H. Danforth of Stanford University, assisted by Miss Frances Foster, opened the way for the study of some of the controlling influences in the production of feathers, Prof. Danforth said.

"It has been found," Dr. Danforth explained, "that a number of the characteristics of feathers are controlled by factors which are inherent in the skin, or feather follicles themselves, rather than by general constitutional peculiarities of the breed as a whole. The reason why chicks of some breeds produce a good covering of feathers rather young, while other breeds are slow in this respect, is found to be due in a large measure to inherent characteristics of the skin itself. Barring, mottling and penciling which might have been ascribed to nervous or constitutional influences are found in general to be due to factors that are resident in the feather follicles.

"It is not something about the Plymouth Rock as an entire organism that gives it a barred plumage, but an inherent rhythmicity in the color producing function of its individual follicles. When the union of host and grafted skin is good, feathers typical of two entirely different breeds may grow side by side with even less space intervening than is normally present between two adjacent feathers.

"At the same time evidence has been found in some cases of a certain amount of incompatibility between graft and host tissues and feathers produced by grafted skin may be greatly influenced by the endocrine condition of the host, as revealed especially by secondary sexual characteristics. Thus skin from a Leghorn male grafted on a Plymouth Rock female produced feathers characteristic of a Leghorn female.

"The rare appearance of a mosaic feather which reveals characteristics of both the donor and the host suggests a parallelism with hybrids in plants, and indicates that cells of very different lines of descent may join harmoniously with one another in the production of a single feather."

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